TITLE OF THE INVENTION

ELASTIC TRANSFER BELT

INVENTORS

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CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority under 35 U.S.C. § 119 of German Patent Application No. 100 07 337.9, filed on February 17, 2000, the disclosure of which is expressly incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The invention relates to an elastic transfer belt and process for guiding a fibrous material web, in particular a paper, cardboard, or tissue web in machines for producing and/or processing the same provided in the zone of the press section for dewatering and/or the subsequent drying section for drying the fibrous material web.

2. Discussion of Background Information

[0002] In the interest of a fibrous material web traveling in a stable manner, in particular at high speeds, the fibrous material web is guided, if possible continuously, by at least one roll or belt. This is particularly important for the press section for dewatering the fibrous material web and the transition to the drying section in production machines.

[0003] In the drying section, the fibrous material web travels over heated drying cylinders guided by drying wires. Here, in particular, when accepting the moist fibrous material web from the drying cylinders, tensile stress develops, mainly in the initial zone of the drying section, thus stretching the fibrous material web. This is caused by the adhesion of the fibrous material web to the smooth surface of the drying cylinders which must be designed in that manner in order to ensure a large, heated contact area and in order to avoid markings. The stretching of the fibrous material web can lead to the development of bubbles and folds or even to web breaks.

SUMMARY OF THE INVENTION

[0004] Therefore, the present invention reduces or even eliminates the stretching of the fibrous material web in the drying section while ensuring a secure web guidance.

[0005] The present invention includes a transfer belt traveling at the same speed as or at an only slightly greater speed than the delivery element during the acceptance of the fibrous material web from a delivery element, traveling at the same speed as or at an only slightly greater speed than the accepting element during the delivery of the fibrous material web to an accepting element, and being driven and slowed in such a way that it is stretched more during the delivery than during the acceptance of the fibrous material web. This lengthwise stretching direction also leads to a considerable stretching of the fibrous material web guided by the transfer belt between the acceptance and the delivery.

[0006] Preferably, this can be achieved, e.g., by driving or slowing the transfer belt using guiding rolls with at least one guiding roll, provided in the zone of the delivery of the fibrous material web or thereafter, rotating faster than at least one guiding roll provided in the zone of the acceptance of the fibrous material web or thereafter. With respect to slowing and driving the transfer belt, the acceptance and delivery is designed to be relatively simple and secure when a correlating roll in the zone of the acceptance of the fibrous material web has about the same speed than the subsequent guiding roll.

[0007] Here, it is essential to realize that the wet fibrous material web stretches irreversibly in the first tensile stress. Subsequent tensile stress leads to additional stretching only when the tensile stress is higher than during the first stretching. However, the device according to the invention offers the possibility of stretching the fibrous material web to a relatively large extent and in a relatively controlled manner

in the zone of the press section as well as at the beginning of the drying section although the fibrous material web is continuously guided by at least a belt or a roll.

[0008] This stretching, i.e., the necessary tensile stress therefor, should be greater than the subsequent tensile stresses in the drying section, in particular due to the high moisture content in the initial zone of the drying section. Due to the above-mentioned special force deformation behavior of the moist fibrous material web, stretching in the drying section can thus be avoided or drastically reduced, in particular in the initial zone.

[0009] For this purpose, the speed of the transfer belt at acceptance should be lower by about 0.2% to 5.0%, preferably by about 0.5% to 4.0%, than at delivery of the fibrous material web to the acceptance element. Additionally, it is advantageous when the transfer belt travels between the press section and the drying section, with the transfer belt accepting little or no open draw from the delivery element and delivering little or no open draw to the acceptance element. Here, the delivery element should be a roll or a belt, preferably a belt in the form of a pressed felt as well as the acceptance element be a roll or a belt, preferably a roll in the form of a drying cylinder or a suctioned roll. In this case, the delivery of the fibrous material web is facilitated when the transfer belt wraps around the drying cylinder or the suctioned roll.

[0010] In order to design the acceptance, the delivery, and the transportation of the fibrous material web more securely, the transfer belt should be permeable. This allows the possibility of providing suction devices at the acceptance of the fibrous material web from a press felt as well as subsequently on the side of the transfer belt opposite of the fibrous material web. If the transfer belt is redirected at a guide roll between the delivery and acceptance of the fibrous material web, that guide roll should also be suctioned. A surface of the transfer belt as smooth as possible is

advantageous for an improved adhesion of the fibrous material web to the transfer belt.

[0011] The present invention is directed to an apparatus for guiding a fibrous material web in machines for at least one of producing and processing the fibrous material web. The apparatus includes an elastic transfer belt arranged to transfer the fibrous material web between an acceptance region and a delivery region, and a delivery element arranged to deliver the fibrous material web to the elastic transfer belt. During acceptance of the fibrous material web from the delivery element, the elastic transfer belt is arranged to travel at a same speed as or at only a slightly higher speed than the delivery element. An accepting element is arranged to accept the fibrous material web from the elastic transfer belt. During delivery of the fibrous material web to the accepting element, the transfer belt is arranged to travel with a same speed as or with only a slightly higher speed than the accepting element. The transfer belt is driven or slowed to be stretched more during delivery of the fibrous material web to the accepting element belt than during acceptance of the fibrous material web from the delivery element.

[0012] According to a feature of the instant invention, the elastic transfer belt can be arranged in at least one of a region of a press section for dewatering and a drying section for drying the fibrous material web. Further, the fibrous material web may include one of a paper, cardboard, and tissue web.

[0013] In accordance with another feature of the invention, guide rolls are arranged to control speeds of the elastic transfer belt. At least one of the guide rolls can be positioned in, or subsequently to, a region of delivery of the fibrous material web by the elastic transfer belt, and at least one other guide roll can be positioned in, or subsequent to, a region of acceptance of the fibrous material web by the elastic transfer belt. The at least one guide roll mayh be arranged to rotate faster than the at

least one other guide roll. Further, at least one additional roll can be positioned in the region of acceptance of the fibrous material web by the elastic transfer belt has about a same speed as the at least one other guide roll. Moreover, the at least one guide roll may be positioned behind, relative to a web travel direction, the region of delivery of the fibrous material web to the elastic transfer belt.

[0014] According to still another feature of the present invention, a speed of the elastic transfer belt during the acceptance of the fibrous material web by the elastic transfer belt may be about 0.2% to 5.0% lower than during the delivery of the fibrous material web to the acceptance element. Further, the speed of the elastic transfer belt during the acceptance of the fibrous material web by the elastic transfer belt can be about 0.5% to 4.0% lower than during the delivery of the fibrous material web to the acceptance element.

[0015] The elastic transfer belt can be arranged to travel between a press section and a drying section. The fibrous material web may be continuously guided by at least one roll or belt in the press section.

[0016] Further, the elastic transfer belt may be arranged to at least one of accept the fibrous material web without any open draw from the delivery element and deliver the fibrous material web without any open draw to the accepting element.

[0017] The delivery element can include one of a roll and a belt, and the delivery element can include a press felt.

[0018] The accepting element can include one of a roll and a belt, and the accepting element can include one of a drying cylinder and a suctioned roll.

[0019] In accordance with a further feature of the invention, the elastic transfer belt may be permeable. Further, suction devices can be arranged on sides of the elastic transfer belt opposite to the fibrous material web.

[0020] The elastic transfer belt can have a smooth surface. Moreover, a guide

roll may be arranged to guide the elastic transfer belt, and the guide roll may be positioned between the delivery of the fibrous material web to the acceptance element and the acceptance of the fibrous material web from the delivery element. The guide roll may include a suctioned roll.

[0021] The present invention is directed to a process for guiding a fibrous material web in an apparatus for at least one of producing and processing the fibrous material web, the apparatus including an elastic transfer belt, a delivery element and an accepting element. The process includes transferring, on the elastic transfer belt, the fibrous material web between an acceptance region and a delivery region, and accepting, on the elastic transfer belt, the fibrous material web from the delivery element, and driving the elastic transfer belt, during the accepting of the fibrous material web from the delivery element, to travel at a same speed as or at only a slightly higher speed than the delivery element. The process also includes delivering, by the elastic transfer belt, the fibrous material web to the accepting element, and driving the elastic transfer belt, during the delivering of the fibrous material web to the accepting element, to travel with a same speed as or with only a slightly higher speed than the accepting element, and stretching the transfer belt more during the delivering of the fibrous material web to the accepting element belt than during the accepting of the fibrous material web from the delivery element.

[0022] In accordance with a feature of the present invention, the process can further include driving the elastic transfer belt in at least one of a region of a press section for dewatering and a drying section for drying the fibrous material web. Further, the fibrous material web comprises one of a paper, cardboard, and tissue web.

[0023] According to another feature of the invention, the apparatus can further include guide rolls, such that at least one of the guide rolls is positioned in, or subsequently to, a region of delivery of the fibrous material web by the elastic transfer

belt, and at least one other guide roll positioned in, or subsequent to, a region of acceptance of the fibrous material web by the elastic transfer belt, and the stretching may include rotating the at least one guide roll faster than the at least one other guide roll. At least one additional roll can be positioned in the region of acceptance of the fibrous material web by the elastic transfer belt, and the process may further include driving the at least one additional roll at about a same speed as the at least one other guide roll. The at least one guide roll can be positioned behind, relative to a web travel direction, the region of delivery of the fibrous material web to the elastic transfer belt.

[0024] In accordance with still another feature of the present invention, a speed of the elastic transfer belt during the acceptance of the fibrous material web by the elastic transfer belt can be about 0.2% to 5.0% lower than during the delivery of the fibrous material web to the acceptance element, and the speed of the elastic transfer belt during the acceptance of the fibrous material web by the elastic transfer belt is about 0.5% to 4.0% lower than during the delivery of the fibrous material web to the acceptance element.

[0025] The process may further include accepting the fibrous material web on the elastic transfer belt without any open draw from the delivery element and delivering the fibrous material web from the elastic transfer belt without any open draw to the accepting element.

[0026] In accordance with yet another feature of the instant invention, the elastic transfer belt can be permeable. The process may further include suctioning sides of the elastic transfer belt opposite to the fibrous material web.

[0027] Other exemplary embodiments and advantages of the present invention may be ascertained by reviewing the present disclosure and the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The present invention is further described in the detailed description which follows, in reference to the noted plurality of drawings by way of a non-limiting example of an exemplary embodiment of the present invention, and wherein:

[0029] The Figure schematically illustrates a transition between a press section and a drying section of a web production and/or processing machine.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0030] The particulars shown herein are by way of example and for purposes of illustrative discussion of the embodiments of the present invention only and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the present invention. In this regard, no attempt is made to show structural details of the present invention in more detail than is necessary for the fundamental understanding of the present invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the present invention may be embodied in practice.

[0031] In the press section the fibrous material web 1 is guided through one or several press nips, each formed by two press rolls 10. Here, a press felt 6 travels through each press nip for accepting the squeezed out water. During the travel of the fibrous material web 1 through the press section, the fibrous material web 1 is continuously guided by at least one belt or roll, i.e., it travels in closed tension through the press section. This ensures a secure travel, in particular even at higher speeds. Here, for example, one press felt 6 travels on each side of the fibrous material web 1 with the lower press felt 6, after the separation of the upper press felt 6 from the fibrous material web 1, acting as a delivery element 5 and transferring the fibrous material web 1 to the transfer belt 2.

[0032] The transfer belt 2 is not only embodied elastically but also smoothly and permeably. The latter allows the arrangement of suction devices on the side of the transfer belt 2 opposite from the fibrous material web 1 in order to improve the adhesion to the transfer belt 2. Here, the transfer belt 2 wraps around a suctioned guide roll 11 at the acceptance of the fibrous material web 1 from the delivery element 5. The transfer belt 2 is in a slightly stretched state in the web travel direction 9 during the acceptance and travels only slightly faster than the delivery element 5. This small tension improves the acceptance of the fibrous material web

[0033] After acceptance, the transfer belt 2 is guided over a guide roll 8 with a slowing effect. This slowing is necessary because the guide roll 4 provided subsequent to the delivery of the fibrous material web 1 travels at a considerably higher speed. Thus, a relatively strong stretching occurs in the transfer belt 2 and also in the fibrous material web 1 guided thereby. The guide roll 8 positioned between the acceptance and the delivery of the fibrous material web 1 is embodied as a suctioned roll for an improved adhesion of the fibrous material web 1 to the transfer belt 2.

[0034] The acceptance element 3 is a heated drying cylinder 7 and is wrapped by the transfer belt 2 which enables a frictional transfer.

[0035] This stretching of the transfer belt 2 between the guide roll 8 in the middle and the delivery of the fibrous material web 1 should be stronger than any stretching normally to be expected in the drying section. Therefore, the accepting element 3 rotates at a speed higher by about 2.0% than the guide roll 8 in the middle. Since this stretching of the moist fibrous material web 1 is plastic and can only be increased by an even stronger tensile stress, as a result, no further stretching need be expected in the drying section.

[0036] In the drying section, the fibrous material web 1 travels for the purpose of drying alternately over heated drying cylinders 7 and suctioned guide rolls 14, with

the fibrous material web 1 being guided by at least one drying wire.

[0037] In contrast to the usual guide rolls 12 the suctioned guide rolls or rolls 8, 11, and 14 have a perforated roll jacket whose inner core is connected to a vacuum source.

[0038] It is noted that the foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the present invention. While the present invention has been described with reference to an exemplary embodiment, it is understood that the words which have been used herein are words of description and illustration, rather than words of limitation. Changes may be made, within the purview of the appended claims, as presently stated and as amended, without departing from the scope and spirit of the present invention in its aspects. Although the present invention has been described herein with reference to particular means, materials and embodiments, the present invention is not intended to be limited to the particulars disclosed herein; rather, the present invention extends to all functionally equivalent structures, methods and uses, such as are within the scope of the appended claims.